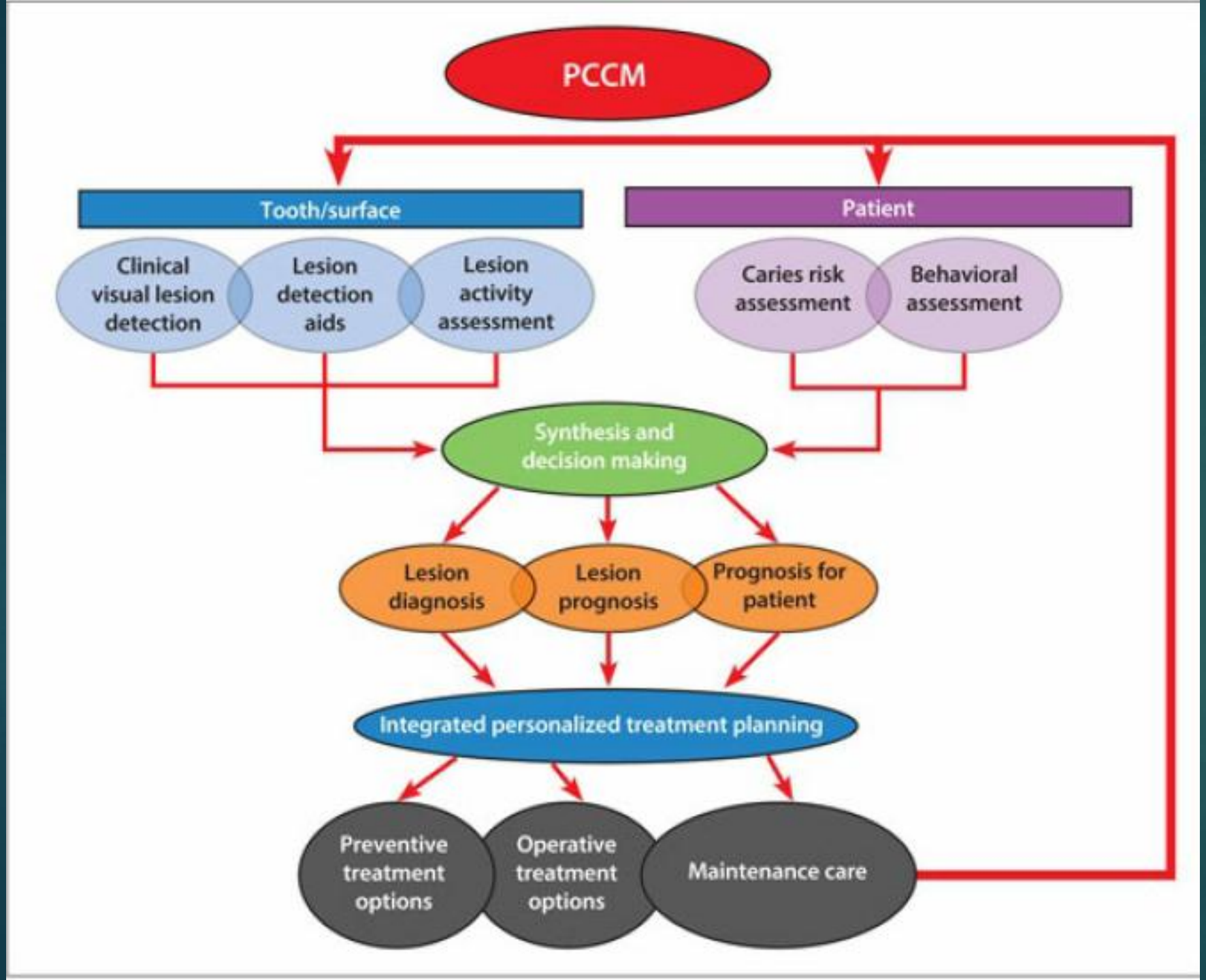
Caries Management: Diagnosis and Treatment Strategies

- Traditional caries management has consisted of the detection of caries lesions followed by immediate restoration. In other words, caries was managed primarily by restorative dentistry

- it may be the start of a restorative cycle in which the restoration will be replaced several times
- A new paradigm for caries management, patient-centered caries management (PCCM), is recommended. PCCM is enabled by the International Caries Detection and Assessment System (ICDAS) clinical visual scoring system for caries detection and activity. When integrated into the caries management by risk assessment (CAMBRA), treatment of caries is a process that can be controlled so that lesions may never form or, if they do, lesion progression can be arrested

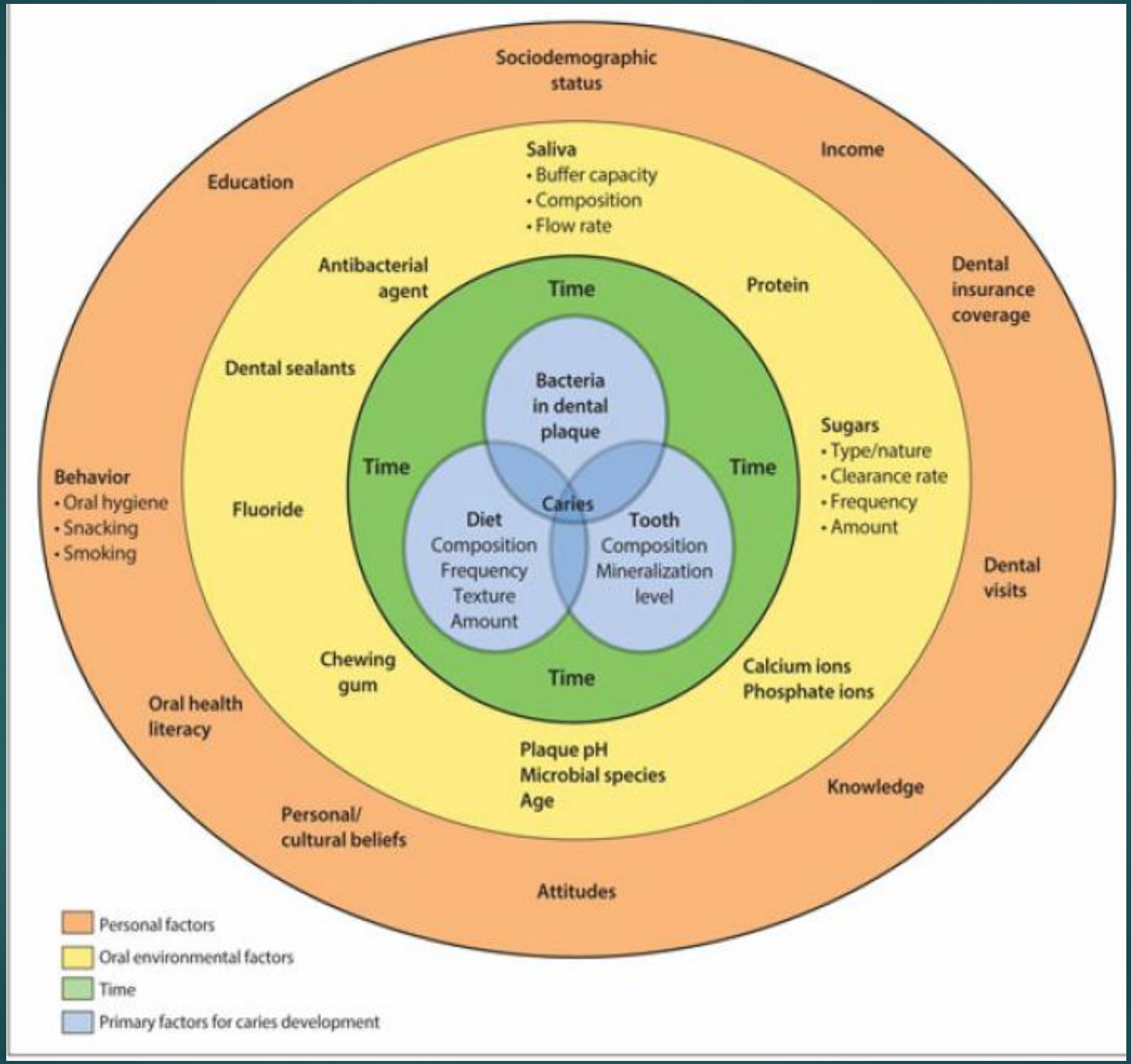
- The PCCM strategy involves a comprehensive assessment and includes evaluation of the caries risk and protective factors, detection and diagnosis of caries, and determination of the activity of existing caries in order to establish the individual patient's caries risk


PCCM
Tooth/surface
Patient
Clinical visual lesion detection
Lesion detection aids
Lesion activity assessment
Caries risk assessment
Behavioral assessment
Synthesis and decision making
Lesion diagnosis
Lesion prognosis
Prognosis for patient
Integrated personalized treatment planning
Preventive treatment options
Operative treatment options
Maintenance care

- The treatment goal in caries management should be to prevent new lesions from forming, to detect lesions sufficiently early in the process so that they can be treated and arrested by noninvasive means, and to educate patients on the cause of the disease to gain their cooperation with recommended preventive strategies

The Caries Process

- the tooth, dental plaque, and diet


Sociodemographic status
Education
Income
Saliva
• Buffer capacity
• Composition
• Flow rate
Antibacterial agent
Protein
Dental insurance coverage
Time
Dental sealants
Bacteria in dental plaque
Sugars
• Type/nature
• Clearance rate
• Frequency
• Amount
Time
Time
Behavior
• Oral hygiene
• Snacking
• Smoking
Caries
Fluoride
Diet
Composition
Frequency
Texture
Amount
Tooth
Composition
Mineralization level
Dental visits
Chewing gum
Time
Calcium ions
Phosphate ions
Oral health literacy
Plaque pH
Microbial species
Age
Knowledge
Personal/ cultural beliefs
Attitudes
Personal factors
Oral environmental factors
Time
Primary factors for caries development

Dental plaque

- The prevalence of mutans streptococci and lactobacilli is associated with dental caries. *Streptococcus mutans* is involved in caries lesion formation from its initiation, while lactobacilli flourish in a carious environment and contribute to caries progression
- These counts do not give site-specific information and are poor predictors of high cariesactivity in general, although low counts or absence of mutans streptococci are good predictors of low caries activity
- High numbers of mutans streptococci and lactobacilli are probably the consequence of a high sugar intake and the resulting periods of low pH levels in dental plaque

- it has been shown that restriction of sugar intake reduces the numbers of mutans streptococci and lactobacilli
- A comparable reduction was found in subjects who reduced their sugar intake frequency from 7.2 to ⅛ times per day
- the decrease in mutans streptococci was more pronounced on buccal than on proximal tooth surfaces, and, interestingly, the pH response to glucose was reduced in buccal but not in interdental plaque
- Six weeks after completing the sugar restriction period, the numbers of mutans streptococci increased again

- The oral flora colonizes on teeth continuously, but it takes up to several days before the dental plaque contains enough acidogenic bacteria to lower plaque pH to the level that causes demineralization

- Theoretically, plaque removal every second day would be sufficient

- If the dentition is professionally cleaned, an even lower frequency of home-care cleaning has been demonstrated to prevent caries

- But considering the caries prevalence in the prefluoride era, it is obvious that few people are capable of cleaning their teeth to a level adequate to prevent caries

Teeth

- Remineralization is a slower process than demineralization
- Dentin is more vulnerable than enamel because of structural differences and greater numbers of impurities in the crystal lattice, which facilitate its degradation in an acidic environment
- posteruptive use of fluoride is far more protective against caries
- Enamel in primary teeth is less mineralized and more variable than permanent enamel. Optically it is more opaque, which may represent greater porosity. It gives the clinical impression of wearing more quickly and being less resistant to caries

Diet

- dietary advice for caries prevention is based on three principles: *(1)* the drop in pH lasts for approximately 30 minutes; *(2)* the frequency of intake is more important than the quantity; and *(3)* the stickiness of foods is an important factor in their cariogenicity
- from many epidemiologic studies where fluoride is used daily, that sugar consumption and caries prevalence have become less tightly related for many individuals
- fluoride administration was far more effective in reducing caries than lowering sugar supplies
- With this evidence, the role of dietary counseling in caries prevention should be reexamined. This does not negate the value of diet analysis and advice for patients presenting with multiple caries lesions, but the importance of the proper use of fluoride should always be emphasized

- A pH drop induced by eating may last for hours if there is no stimulation of the salivary flow
- Long pH depressions will be most prevalent in areas where saliva has little or no access, and these areas are the most caries prone
- A chocolate and caramel bar might be considered bad because it feels sticky. In reality, however, the caramel dissolves and leaves the mouth relatively quickly,
- whereas potato chips, generally considered less harmful, take a longer time to clear from the mouth
- To snack in moderation, limited to 3 or 4 snacks a day, is the only wise recommendation

Time

- Now we know that caries is not a chronic disease and that its effects can be arrested or completely repaired if enough time is given for remineralization
- it is clear that caries lesions do not develop overnight but take time; in fact, it may take years for a caries lesion to develop a distinct discontinuity or break in its surface integrity (otherwise called *cavitation*). This potentially gives the dentist and the patient ample time for preventive treatment strategies

Fluoride

- Experiments have shown that fluoride protects enamel more effectively when it is present in the ambient solution during acid challenges than when it is incorporated into the enamel crystal lattice
- The retention of fluoride in the mouth is site specific. In plaque and saliva and in dentin samples fixed in dental splints, most fluoride was found on the labial surfaces of maxillary incisors and buccal surfaces in the mandibular molar region after rinsing with a fluoride solution
- In addition, it was observed that fluoride from passively dissolving fluoride tablets remained highly concentrated only at the site of tablet dissolution

- There was very little or no transport of fluoride between the right and the left sides of the mouth and between the maxillary and mandibular arches
- Because of this, localized caries lesions in the mouth may be related to an insufficient spread of fluoride when subjects use fluoride toothpaste
- When patients use fluoride toothpaste, they should be encouraged to spit out any excess rather than to rinse vigorously with water. Alternatively, the toothpaste slurry may first be used as a mouth rinse

Saliva

- The important role of saliva is clearly demonstrated by the rampant caries, that may occur in subjects with compromised salivary flow

These subjects lack the protective qualities of saliva, of which the flow rate and bufferin capacity may be the most important. Both help to neutralize and clear the acids and carbohydrates from dental plaque

Table 5-1 Functions of components of saliva involved in the caries process

Components	Functions
Mucins, lysozyme, lactoferrin, lactoperoxidase	Antibacterial
Histamine, agglutinin, cystatines	Antibacterial
Secretory immunoglobulin A, alphaamylase, histatins, histidine-rich proteins	Antibacterial
Proline-rich glycoprotein, mucins	Lubrication/viscoelasticity
Mucins	Inhibition of demineralization
Proline-rich proteins, statherin, calcium phosphate	Remineralization
Bicarbonate, phosphate, urea, arginineric proteins	Buffering

- Clearance, however, is not uniform throughout the mouth and may be slowest at the labial aspects of the maxillary incisors and buccal aspects of the mandibular molars

- The sites that are difficult for saliva to reach also may be difficult to reach with mechanical cleaning devices, such as a toothbrush or dental floss
- Plaque and food may adhere for long periods of time in these areas, making these sites more prone to caries
- this caries risk factor may be overlooked in children, whose teeth appear to be clean as judged from the sites that are easily cleaned
- These children may brush twice daily, have only a moderate frequency of sugar intake per day, and still develop caries lesions at these sites
- The most feasible way to prevent caries lesions at these sites is by thorough oral hygiene measures and use of a fluoride-containing toothpaste so that plaque is removed and fluoride is applied


a


b

Social and demographic factors

- Many studies have shown that, at least in the western world, dental caries is more prevalent in lower socioeconomic categories, in less affluent areas, and among some ethnic minorities
- Differences related to socioeconomic status are very clear for the primary dentition and less clear for the permanent dentition, although this pattern may differ in other parts of the world
- Studies have shown that for the prediction of caries lesion development, social and demographic factors may be successful in very young children without a long dental history, but for older children, clinical parameters such as the dmfs surfaces in and DMFS
- root caries lesion development again seems to be more prevalent in people from lower socioeconomic backgrounds

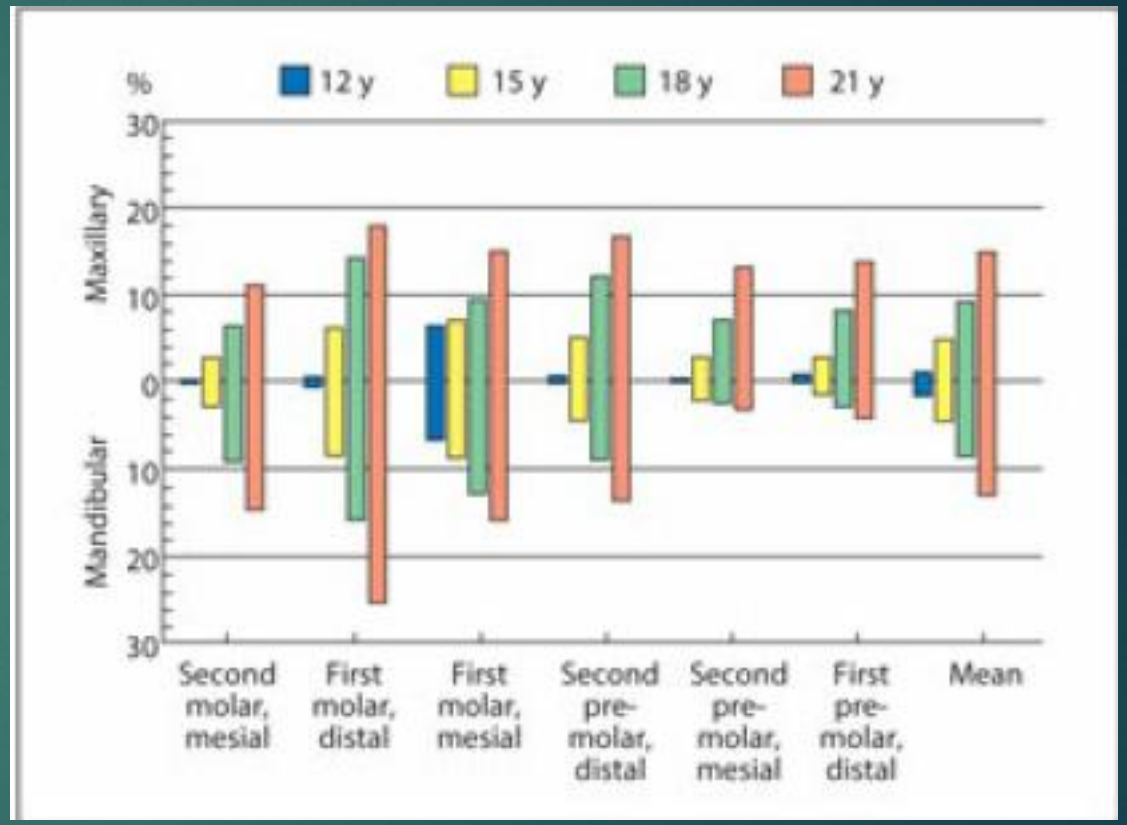
Table 5-3 **Timeline of strongest clinical predictors of caries incidence**[11]

	Age (y)						
	0 and 1	2–5	6–9	10–13	14–21	22–45	
Dentition	Primary	Primary	Mixed	Mixed	Early permanent	Mature permanent	M pe an re
Predictor*	Mutans streptococci	**dmfs, especially primary incisors;** mutans streptococci and lactobacilli	**dmfs, especially primary molars;** first molar occlusal morphology: DMFS	**DMFS, especially permanent first molars;** first molar occlusal morphology; incipient smoothsurface lesions	**Incipient smoothsurface lesions;** DMFS	Not studied	C an DI mu te pe dis

Rate of caries lesion progression

- Caries lesions progress more slowly than they did several decades ago, probably due to increased use of fluoride, which delays lesion progression
- It is clear that the progression rate is not the same for each site
- Longitudinal epidemiologic data from the 1950s, when fluoride was not yet widely used, showed that it took approximately 1 year for an enamel fissure lesion to develop into a dentinal lesion
- More recent data from the same geographic area, after the introduction of fluoride toothpaste, showed that 50% of the enamel fissure lesions had progressed to involve dentin within 2 years while 75% had become dentinal lesions after 4 years

- it takes an average of 4 years for caries lesions to progress through the proximal enamel of permanent teeth. The progression rate seemed to be independent of the DMFS of the individuals
- Not all caries lesions progress



- The prevalence was low, with the distal surfaces of the first molars being the most prone to developing caries lesions

- Caries lesions on free smooth surfaces seem to progress more slowly than on proximal surfaces or in fissures. Many lesions do not progress into the dentin and even show regression to sound enamel
- the evidence indicates that the decline in caries prevalence has been accompanied by a decline in caries lesion progression rates. Between the initiation of caries and the involvement of dentin in the caries process, there is ample time for a preventive management strategy. This implies that the early lesion should be detected so that preventive treatment can arrest its progress and bring about lesion arrest/remineralization. If this strategy is successful, operative intervention will not be required

Detection and Diagnosis

- Caries, however, is a highly dynamic process characterized by alternating periods of demineralization and remineralization
- detection only describes the clinical signs of caries, diagnosis tries to estimate the dynamics and determinants of the process
- White spot lesion is found by detection; after diagnosis, it may be called an *initial caries lesion*

Detection

- The primary objective of early detection of caries is to limit the progression and impact of the disease after onset at as early a stage as possible
- The conventional caries detection methods are visual and radiographic examinations

Visual examination

- *Clean tooth*
- *Dry tooth*
- *Magnification and lighting*

Clean tooth
Dry tooth
Magnification and lighting

- Furthermore, drying the tooth surface during examination has diagnostic as well as prognostic functions. Removing water from the porous tissue enables the dentist to gauge how far through the enamel a lesion has progressed
- A white spot lesion visible on a wet tooth surface indicates that demineralization is over halfway through the enamel, possibly extending into dentin. A white spot lesion that becomes visible only after thorough air drying will be less than halfway through enamel
- Prognostically, the latter condition has a better chance of complete reversal, while the former condition may only be arrested

Table 5-4	Differences between white spots due to caries or developmental hypomineralization	
Characteristic	**Caries**	**Hypomineralization**
Appearance and texture	Opaque, chalky, and matte (rough) surface when air dried	Smooth, glossy, and less opaque surface when air dried
	May be discolored by extrinsic stain	No extrinsic discolorat
	Feels rough when the tip of a CPITN probe or blunt explorer is moved gently across the surface	Feels smooth when the tip of a CPITN probe or blunt explorer is moved gently across the surface
Location and distribution	Located in plaque stagnation areas	Located mainly in self-cleansing areas
		Bilateral or multiple corresponding teeth; eg, canines

Clinical system

Table 5-5	ICDAS criteria for visual examination of caries lesions, including two-digit coding for restoration and caries severity[53] The International Caries Detection and Assessment System (ICDAS) is highly recognized among these systems.[53,53] The International Caries Detection and Assessment System (ICDAS) is highly recognized among these systems.[60]
First digit (restoration and sealant codes)	**Second digit (caries severity codes)**
0 = Not sealed or restored	0 = Sound tooth surface
1 = Partial sealant	1 = First visual change (opacity or discoloration) in enamel hardly visible on the wet surface but distinctly visible after air drying
2 = Full sealant	2 = Distinct visual change (opacity or discoloration) in enamel, visible without air drying
3 = Tooth-colored restoration	3 = Enamel breakdown, no dentin visible
4 = Amalgam restoration	4 = Dentin shadow (not cavitated into dentin)
5 = Stainless steel crown	5 = Distinct cavity with visible dentin
6 = Porcelain, gold, PFM crown or veneer	6 = Extensive distinct cavity with visible dentin
7 = Defective restoration	
8 = Temporary restoration	

Table 5-6	Correlation of the ICDAS caries severity codes with the histologic depth of the lesions into the tooth tissue on the occlusal surface,[55–58]
Score	**Demineralization depth**
0	No enamel demineralization
1	Enamel demineralization limited to the outer half of the enamel layer
2	Demineralization involving enamel and the outer third of the dentin
3-4	Demineralization involving the middle third of the dentin
5-6	Demineralization involving the pulpal third of the dentin

Table 5-7	ICCS codes for general practice*			
	Stages of caries (0–3)			
Sites of caries (1–4)	0 No disease ICDAS 0	1 Initial lesion ICDAS 1 and 2	2 Moderate lesion ICDAS 3 and 4	3 Extensive lesion ICDAS 5 and 6
1. Pits and fissures	1.0	1.1	1.2	1.3
2. Approximal surfaces	2.0	2.1	2.2	2.3
3. Cervical and smooth surfaces	3.0	3.1	3.2	3.3
4. Root surfaces	4.0	4.1	4.2	4.3

Visual caries detection specific to different types of lesions

- **Pit and fissure**
- Detection of carious structure in fissures and pits is most often performed by visual inspection
- Any sign of visible cavitation in the occlusal surface corresponds to progression of the lesion into the dentin
- Shadowing or grayish discoloration of the adjacent translucent enamel along the pits and fissures may indicate possible undermining of enamel by hidden caries
- Opaque, matte texture of enamel adjacent to the stained pits and fissures may indicate the presence of active caries underneath them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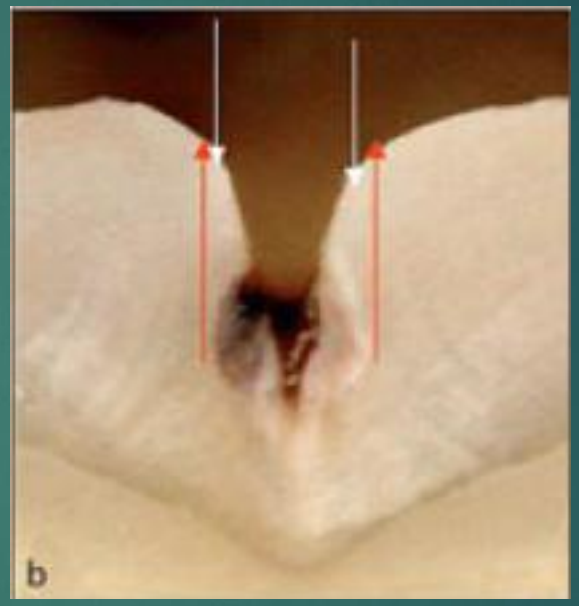
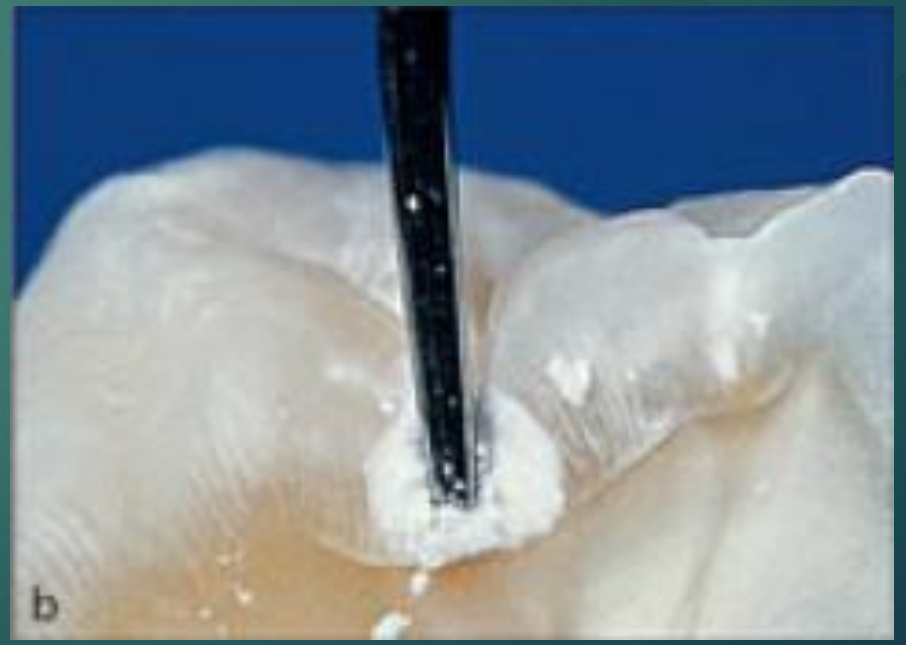

b

- Careful examination of bitewing radiographs is also important, although occlusal enamel lesions will not be visible. Carious dentin, however, can usually be detected, and such lesions are often large
- Bitewing radiographs provide a “safety net” for detecting occlusal lesions


a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- • Detect and remove plaque in fissures, along gingival margins, and in proximal Spaces
- • Gently “feel” margins and defects to confirm and assess cavitations

- • Gently feel” the hardness of root surface lesions.
- • Gently “feel” the texture (roughness) of white spot lesions by gentle running of the tip of a ball-ended CPITN probe or blunt explorer on the surface of the lesion

Lesions involving proximal surfaces

- Extensive active proximal lesions can be revealed by shadowing or grayish discoloration of the undermined occlusal enamel ridge
- when there is contact between proximal surfaces, the radiograph is the most accurate method for detecting demineralization
- In the premolar and molar regions, lesion progression or arrest can be monitored, provided that subsequent bitewing radiographs are taken at approximately the same angulation


a


b

- For detection of proximal lesions in anterior teeth, the fiber-optic transillumination technique is particularly appropriate and convenient
- With this technique, a fine light, coned down to a 0.5-mm diameter, is transmitted through a contact area. A lesion appears as a dark shadow
- It is difficult, however, to discriminate between demineralization extending just into enamel and that progressing further into dentin, especially in the posterior areas
- use of an orthodontic separator has been advocated in some cases to allow the dentist to see more clearly and to gently feel for a break in the enamel surface

Lesions on buccal, lingual, and root surfaces

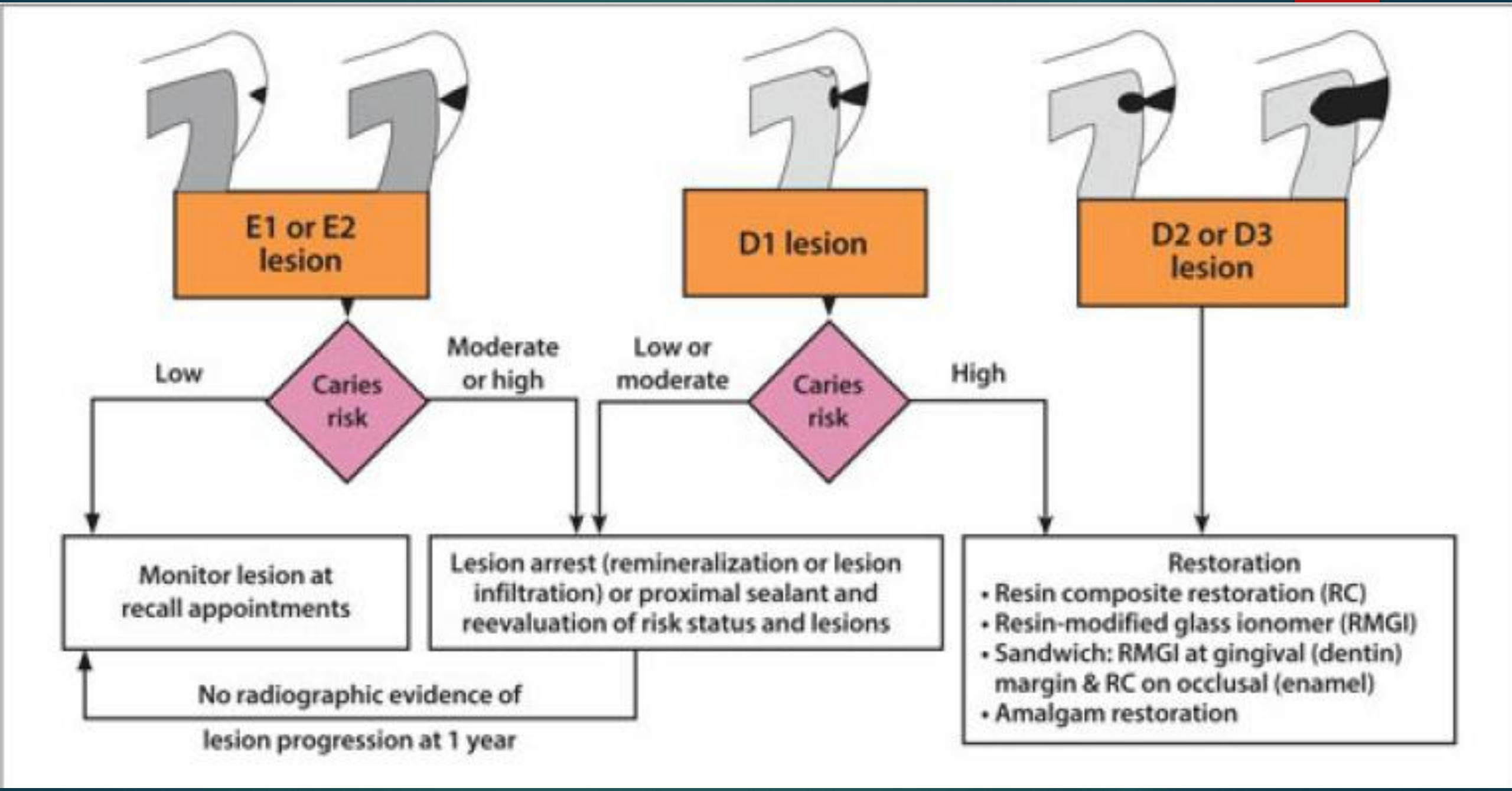
- Active caries lesions in smooth, free enamel surfaces are typically located close to the gingival margin and have chalky matte, whitish/ yellowish surfaces
- A caries lesion on a root surface is seen as a clearly demarcated, light brown, dark brown, or black discolored area on the root surface or at the cementoenamel junction
- *Cavitated*
- *noncavitated*

Secondary or recurrent caries

- primary lesions at the margins of a restoration
- The clinical criteria are thus identical to those for primary caries
- The dentist can check that the restoration is secure in the cavity by pushing it with an explorer; a loose restoration ensures plaque stagnation, and active caries is likely to be present

Radiographic examination

- Bitewing
- The importance of radiographs to diagnose initial caries lesions in proximal surfaces is well established
- In deeper occlusal lesions reaching the dentin, radiographs show a high *specificity* (the identification of true negatives). Although useful for proximal surfaces, the bitewing radiograph still cannot distinguish between cavitated and noncavitated proximal lesions
- it is necessary to establish what level of radiolucency should be accepted as cavitation


E1 or E2 lesion
D1 lesion
D2 or D3 lesion
Caries risk
Low
Moderate or high
Caries risk
Low or moderate
High
Monitor lesion at recall appointments
Lesion arrest (remineralization or lesion infiltration) or proximal sealant and reevaluation of risk status and lesions
Restoration
• Resin composite restoration (RC)
• Resin-modified glass ionomer (RMGI)
• Sandwich: RMGI at gingival (dentin) margin & RC on occlusal (enamel)
• Amalgam restoration
No radiographic evidence of lesion progression at 1 year

- Radiographs have been shown to underestimate the depth of the lesion
- Bitewing radiography is associated with the problem of variation in the quality of radiographs and differences in the viewing conditions
- Because lesions confined to enamel should be managed by preventive treatment, radiographic monitoring is important

Diagnosis

- it must be determined whether the detected lesion is active or inactive. If the lesion is arrested, no treatment is required except for esthetic or functional reasons
- caries diagnosis includes both caries detection and the assessment of lesion activity

Assessi

Table 5-8	Characteristics of active and arrested lesions in enamel and roots		
Condition	**Tooth tissue**	**Active**	**Arrested**
Appearance	Enamel	Lesion is chalky (lacks luster) when air dried and is whitish or yellowish	Lesion has shiny surface when air dried and may be whitish, brownish, or blackish
	Root	Clearly demarcated and may be discolored yellowish/light brown *Note: Color change is not a reliable indicator*	Same as active lesion
Texture	Enamel	Feels rough when the tip of the probe (explorer) is moved gently across the surface	Feels hard and more smooth than rough when the tip of the probe is moved gently across the surface
	Root	Lesion has soft or leathery base on gentle probing using blunt or CPITN probe	Lesion has hard and shiny base using blunt or CPITN probe
Translucency	Enamel	Opaque	Semitransparent
	Root	NA	NA
Presence of plaque	Enamel	Lesion covered by plaque	Generally plaque free
	Root	Lesion covered by plaqu	Generally plaque free
Locations	Enamel	Mostly on plaque stagnation areas	Lesion area is usually plaque free
	Root	Anywhere	Same as active lesi
Cavitation	Enamel	From localized surface defect (microcavity) in enamel only to distinct cavity with soft or leathery base on gentle probing	From localized surface defect (microcavity) in enamel only to distinct cavity with hard base on probing with gentle pressure; surface of cavity may be shiny
		Cavitated if there is loss of surface integrity or if the depth is ≥ 0.5 mm measured	

- **Occlusal lesions**
- • White spot lesions that have a matte or visibly frosted surface or are plaque covered (visible after drying or application of a disclosing solution)
- • Cavitated lesions, including small cavities and cavities exposing dentin
- • Lesions visible in dentin on bitewing radiographs
- The lesion may be arrested if white or brown spot lesions with a shiny surface are present

- **Proximal lesions**
- The presence or absence of a cavity is relevant to lesion activity, but this cannot be determined from the radiograph unless the lesion is very deep
- • A patient with proximal lesions on the radiograph who is at high risk for caries
- • A proximal lesion present radiographically plus persistent gingival inflammation despite the patient's attempts to remove plaque with dental floss
- • A lesion not present at previous examination

- The following features indicate that the lesion may be arrested:
- • Successive, reproducible bitewing radiographs showing no lesion progression
- • A patient who is now judged to be at low risk for caries because, following preventive behavior, he or she presents with no new

- **Smooth, free surface lesions**
- These are probably the most straightforward lesions for assessment because they are the most visible. Of all lesions, these are the ones most likely to be arrested by preventive treatment alonelesions

- • White spot lesions close to the gingival margin that have a matte or visibly frosted surface; these are often plaque covered
- • Cavitated, plaque-covered lesions with or without exposed dentin; if dentin is exposed and soft, the dentin is heavily infected and the lesion is active
- The following features indicate that the lesion is arrested:
- • Shiny white or brown lesions, often well exposed due to gingival recession; the lesions are not plaque covered
- • Cavitated lesions, often dark brown, with hard dentin at their bases; the lesions are not plaque covered and are often remote from the gingival margin


a


b

- **Root caries**
- • Close to the gingival margin and plaque covered
- • Soft or leathery in consistency
- Arrested lesions are:
- • Often at some distance from the gingival margin and not covered with plaque
- • As hard as the surrounding healthy root surface

- **Recurrent caries**
- The bitewing radiograph is very important in the diagnosis of recurrent caries lesions because they often form cervical to an existing proximal restoration, in the area of plaque stagnation
- Research has shown that ditching and staining around an amalgam restoration and staining around a tooth-colored restoration are not reliable indicators of an active caries lesion beneath a restoration

Assessing Caries Risk

- a tool for comprehensive caries risk assessment should consist of three major sections:
- the *subjective section: (1)* oral hygiene attitude, including dental plaque control and use of fluoride/other anticaries agents; *(2)* dietary habits; *(3)* access to dental care; *(4)* use of tobacco; and *(5)* use of medications affecting caries risk
- the *objective section: (1)* medical history, *(2)* social history, *(3)* existing caries and restorations, *(4)* saliva properties, and other oral conditions predisposing the patient to caries risk
- The third part is the *synthesis section* that identifies the overall risk level (low,moderate, high) of the patient
- Some tools may contain a fourth section that lists the preventive care options from which the clinician can develop a personalized preventive plan for an individual patient

Identifying the risk factors

- ***Presence of caries***
- ***Dental plaque***
- ***Use of fluoride***
- ***Diet***
- ***Saliva***
- ***Medical history***
- ***Social history***
- 1. Medications, such as antidepressants, antipsychotics, tranquilizers, antihypertensives, and diuretics
- 2. Sjögren syndrome , rheumatoid arthritis presence of this
- 3. Eating disorders, which may induce hyposalivation; this, combined with a poor diet, can lead to extensive caries
- 4. Radiation therapy in the region of the salivary glands for a head and neck malignancy, which often induces xerostomia

Guide to identifying the overall caries risk status of the patient

Table 5-9	American Dental Association (ADA) recommended guide to identifying an overall caries risk status[100]	
Caries risk category	**Younger than 6 years**	**6 years or older**
Low	No white spot or cavitated primary or secondary caries lesions during the last 3 years and no factors that may increase caries risk	No white spot or cavitated primary or secondary caries lesions during the last 3 years and no factors that may increase caries risk
Moderate	No white spot or cavitated primary or secondary caries lesions during the last 3 years but presence of at least one factor that may increase caries risk	One or two white spots or cavitated primary or secondary caries lesions in the last 3 years OR No white spot or cavitated primary or secondary caries lesions in the last 3 years but presence of at least one factor that may increase caries risk
High	• Any white spot or cavitated primary or secondary caries lesions during the last 3 years • Presence of multiple factors that may increase caries risk • Low socioeconomic status, especially in children too young for their risk to be based on caries history • Suboptimal fluoride exposure • Xerostomia	• Three or more white spots or cavitated primary or secondary caries lesions in the last 3 years • Presence of multiple factors that may increase caries risk • Suboptimal fluoride exposure • Xerostomia

Table 5-10	Specific caries risk factors that may guide the overall caries risk status	
Factor	**High risk**	**Low risk**
Plaque	Poor hygiene	Good hygiene
Type of diet	High sucrose	Low sucrose
Carbohydrate frequency	> 7 times per day	< 7 times per day
Resting SFR	< 0.2 mL/min	≥ 0.2 mL/min
Stimulated SFR	< 0.7 mL/min	≥ 0.7 mL/min
Buffer capacity	Low: ↓ pH	High: ↑ pH
Fluorides	Low: ↓ remineralization	Optimal: ↑ remineralization
Caries lesions	White spots	No white spots
Caries activity	Within last 3 years	None
Socioeconomic status	≤ Poverty level	> Twice the poverty level
Mother's caries history	High caries rate	Not caries active
Sibling caries history	High caries rate	Not caries active
Home dental care	None	Established

Risk-Based Caries Management

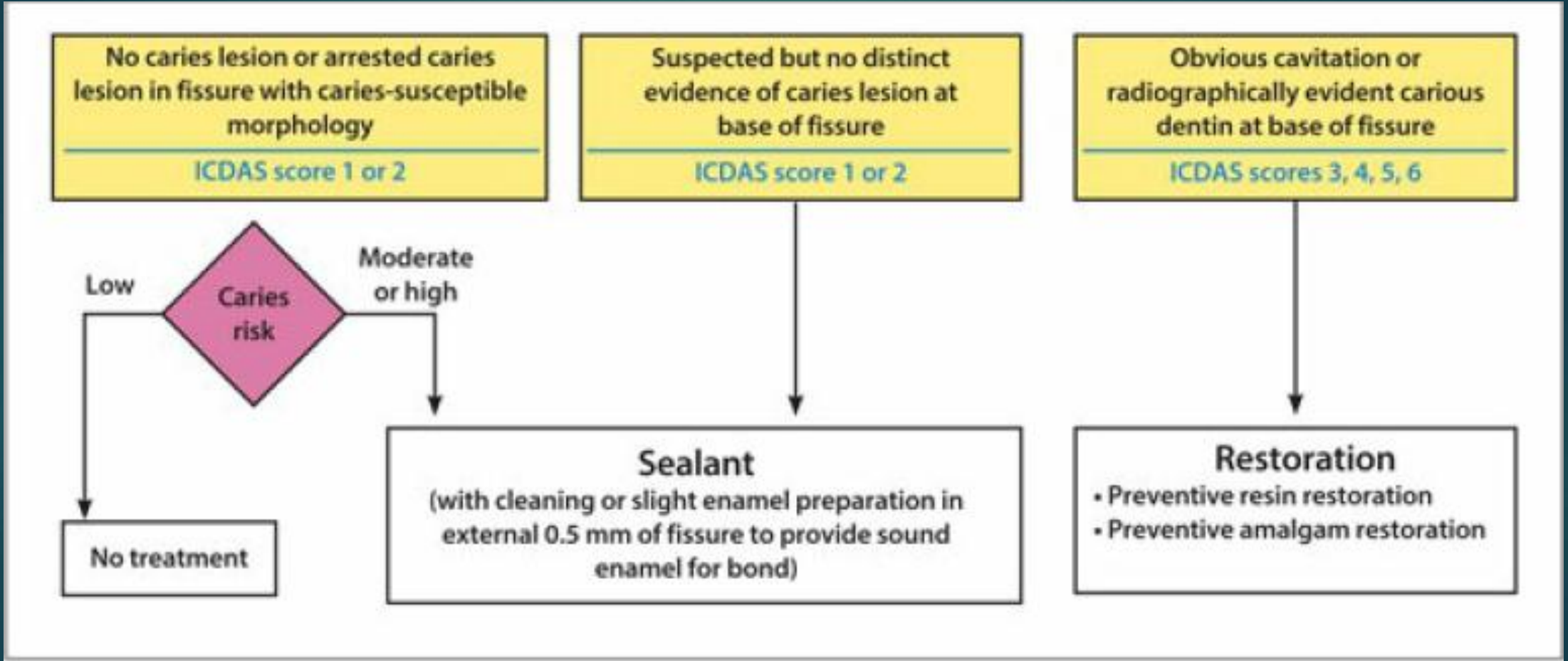
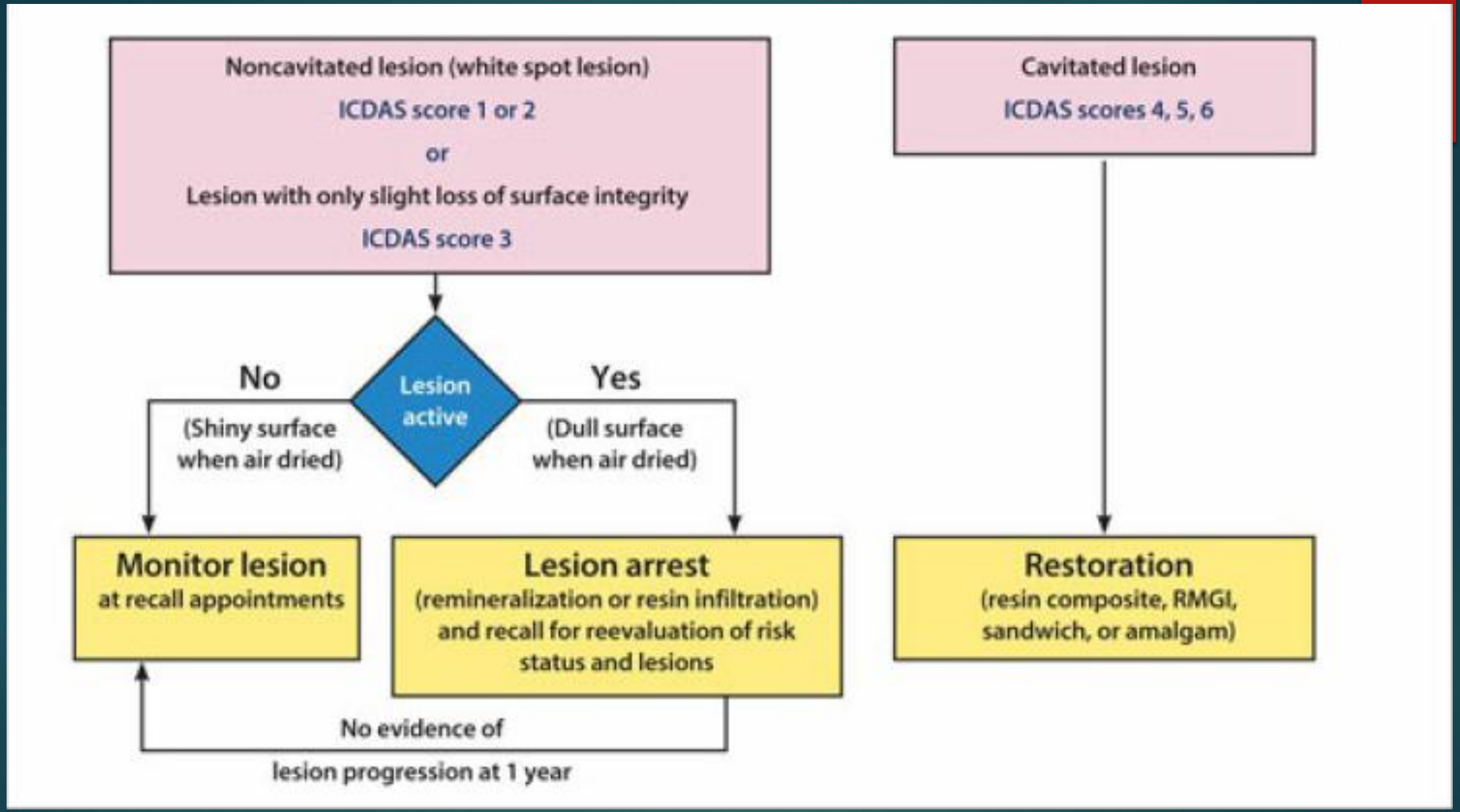
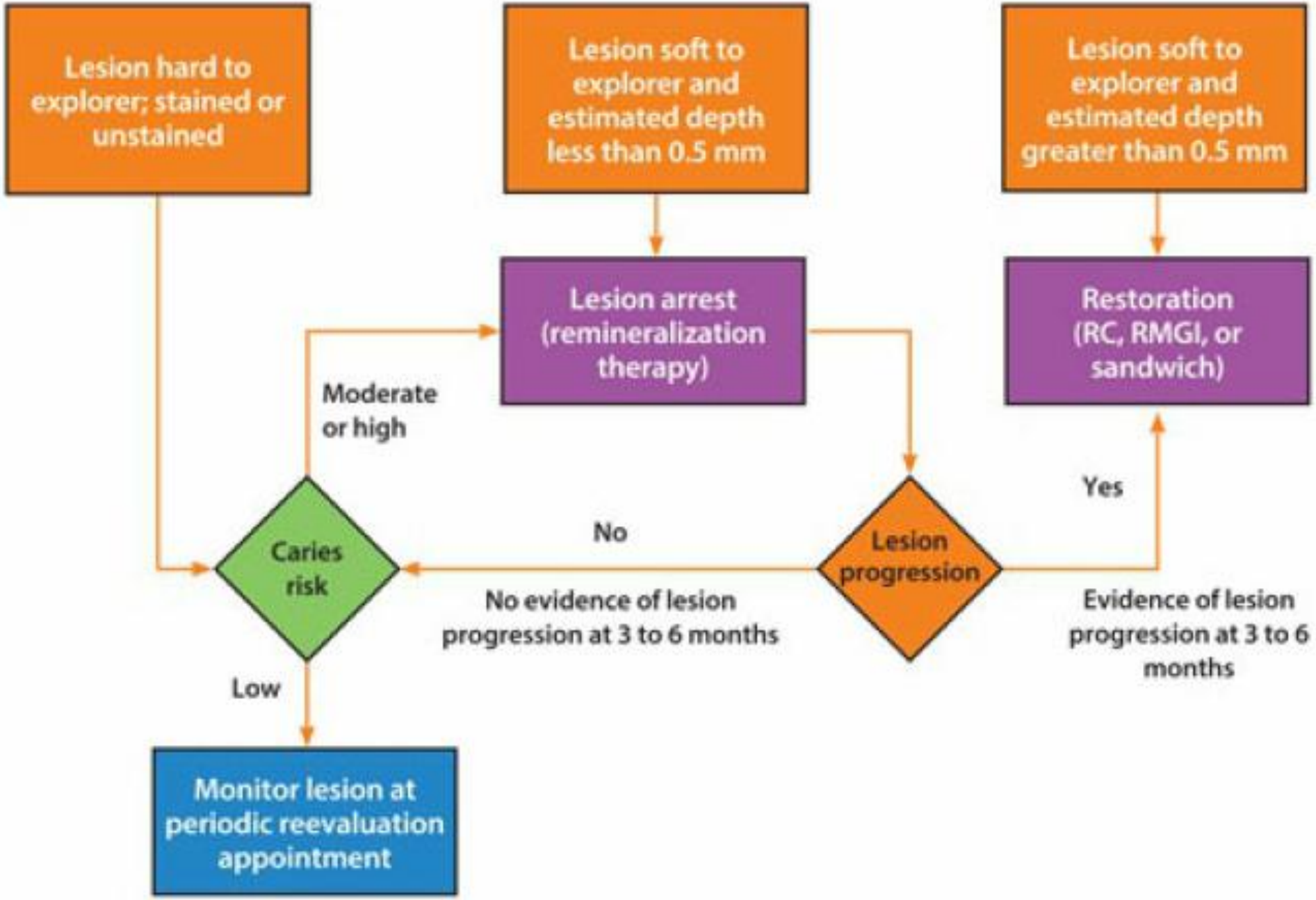


Fig 5-24 Algorithm for caries management in fissured surfaces of permanent teeth. (Courtesy of



in nonproximal coronal smooth surfaces



root surfaces

Box 5-1 **General guidelines for caries management for a high-caries-risk patient, based on PTPM**

Step 1: Plaque control
- Provide prophylactic treatment followed by fluoride application
- See patient regularly to reinforce oral hygiene

Step 2: Treatment of existing caries lesions
- Treat noncavitated lesions as needed
- Restore cavitated lesions and seal surrounding pits and fissures as needed
- Salivary flow measurement to check for dry mouth and treat for xerostomia if needed

Step 3: Protection of surfaces at risk
- Seal all deep pits and fissures
- Apply fluoride varnish to exposed roots

Step 4: Maintenance care for prevention
- Review oral hygiene and dietary habits and advise patient to:
  - Reduce the number of between-meal sweet snacks
  - Substitute snacks rich in protein
- Advise patient to brush at least twice daily with high fluoride delivery toothpaste
- Advise patient to floss once daily
- Provide home treatment and/or other adjunctive therapy:
  - Use over-the-counter fluoride rinse daily
  - Chew or suck xylitol-containing gum or candies three times daily
- Recall patient every 3 months to:
  - Reevaluate current caries risk
  - Receive fluoride varnish treatment of all teeth
- Obtain bitewing radiographs every 3 to 6 months to check for lesions

Box 5-2	General guidelines for caries management for a moderate-caries-risk patient, based on PTPM

Step 1: Plaque control
- Provide prophylactic treatment followed by fluoride application
- See patient regularly to reinforce oral hygiene

Step 2: Treatment of existing caries lesions
- Treat noncavitated lesions as needed
- Restore cavitated lesions and seal surrounding pits and fissures as needed

Step 3: Protection of surfaces at risk
- Seal all deep pits and fissures
- Apply fluoride varnish to exposed roots

Step 4: Maintenance care for prevention
- Review oral hygiene and dietary habits and advise patient to:
  - Reduce the number of between-meal sweet snacks
  - Substitute snacks rich in protein
- Advise patient to brush twice daily with over-thecounter fluoride toothpaste
- Advise patient to floss once daily
- Provide home treatment and/or other adjunctive therapy:
  - Use over-the-counter fluoride rinse daily
  - Chew or suck xylitol-containing gum or candies three times daily
- Recall patient every 3 to 6 months to:
  - Reevaluate current caries risk
  - Receive fluoride varnish treatment of all teeth
- Obtain bitewing radiographs every 12 to 18 months to check for cavities

Box 5-3	General guidelines for caries management for a low-caries-risk patient, based on PTPM

Step 1: Plaque control

- Continue to reinforce oral hygiene

Step 2: Maintenance care for prevention

- Review oral hygiene habits
- Advise patient to brush twice daily with over-the-counter fluoride toothpaste
- Recall patient every 12 to 24 months to reevaluate current caries risk
- Obtain bitewing radiographs every 24 months to check for caries

Preventive and Noninvasive Treatment Options

Table 5-11	Guidelines for basic preventive advice and the use of recommended preventive products*	
Basic preventive steps for moderate/high-risk patients		**Special needs**
Patient motivation	Emphasis on behavioral change	R, H
Diet counseling	Reduction of fermentable carbohydrate intake and frequency Reduction of soft drink consumption and frequency	R, H
Toothbrushing	Twice daily with fluoride toothpaste (preferably three times a day)	R, H
Flossing	Daily, few times a week	R, H
Sugar-free gum	Two pieces for ≥ 5 minutes three times a day (after each meal preferred)	R, H
Sealants	All at-risk surfaces (sound or noncavitated)	H

Adjunct topical therapies for moderate/high-risk patients		Special needs
Home fluoride options:		
Prescription fluoride (5,000 ppm) toothpaste	• Brush at least twice a day (preferably three times a day), including immediately before going to bed • Follow motto "spit, don't rinse" • Apply via tray daily for patients with radiation-induced hyposalivation	R, H
Fluoride rinses	Twice daily/daily/weekly depending on need and produ	R, H
In-office fluoride options:		
Fluoride gel/foams	• 1.23% APF or neutral 2% NaF • 4 minutes, two to four times per year • For root caries, four times over 2 to 4 weeks	R, H
Fluoride varnishes	• Apply to lesions and other surfaces at risk two to four times per year depending on risk	R, H
Potentially helpful adjuncts to home fluoride:		**Special needs**
Xylitol chewing gum	• Xylitol must be listed as first ingredient • Two pieces for ≥ 5 minutes, three times per day (after each meal preferred) for 2 weeks	H
Calcium-based products	Includes paste, toothpaste, mints with/without fluoride; regimen depends on product	H

Table 5-12	ADA evidence-based recommendations for professionally applied topical fluoride[100]		
Risk group	**< 6 years**	**6–18 years**	**> 18 years**
Low	May not receive additional benefit from topical fluoride	May not receive additional benefit from topical fluoride	May not receive additional benefit from topical fluoride
Medium	Varnish every 6 months	Varnish or fluoride gel application every 6 months	Varnish or fluoride gel application every 6 months
High	Varnish every 3 or 6 months	Varnish every 3 or 6 months	Varnish every 3 or 6 months
		or	or
		Fluoride gel application every 3 or 6 mon	Fluoride gel application every 3 or 6 months

- *Caution:* Although some of these mouthrinses tend to recharge glass-ionomer restorations, the pH of the topical fluoride used to recharge glass-ionomer restorations is important. Acidic topical fluoride solutions, such as APF solutions and other acidified fluoride preparations, degrade glass-ionomer materials, porcelain crowns, and veneers and should be avoided in these patients. Resinmodified glass ionomers are more resistant to surface degradation than conventional glass ionomers but still degrade when exposed to acids and orange juice. Resin composites are also degraded by frequent applications of acidic fluoride solutions, producing filler dislodgment and destruction of the filler-resin matrix interface

- Lower-level fluoride (eg, in the United States, 1,100 ppm fluoride) dentifrices generally lead to a caries reduction of around 25%
- Clinical studies have shown that as much as a 75% reduction in caries incidence may be achieved through use of 5,000-ppm fluoride topical treatments
- Clinical studies have demonstrated the ability of ACP-based dentifrices to lower the incidence of root caries and ACP-based mouthrinses to promote remineralization of enamel subsurface lesions. However, there is concern about promotion of dental calculus formation with long-term use

Lesion infiltration

- alternative method of treating active noncavitated lesions extending radiographically into inner enamel or the outer third of dentin that are located on the nonproximal and proximal coronal smooth surfaces

- Following etching of the lesion with hydrochloric acid and achievement of a dried surface using ethanol and air drying, the low-viscosity infiltrant is applied on the lesion surface in two stages
- In the first application, the infiltrant is allowed to infiltrate the lesion for 3 minutes and then is light cured
- In the second application, the infiltrant is allowed to infiltrate for only 1 minute and then is light cured


Thank you.